

## **NERRS Science Collaborative Progress Report for the Period September 1, 2013 through February 28, 2014**

**Project Title:** Collaborative Planning for Climate Change Adaptation: A Case Study in Great Bay National Estuarine Research Reserve (now known as the Climate Adaptation Planning for Exeter (CAPE) project)

**Principal Investigator(s):** Paul Kirshen, Semra Aytur, David Burdick, Michele Holt-Shannon, Steve Jones, Bruce Mallory, Robert Roseen, Paul Stacey, Cameron Wake

**Project start date:** September 1, 2012

**Report compiled by:** Paul Kirshen

**Contributing team members and their role in the project:** Semra Aytur (Collaboration Lead), Michele Holt-Shannon (Stakeholder Assessment Lead), Rob Roseen (Applied Science Investigator (ASI), David Burdick (ASI), Steve Jones (ASI), Paul Stacey (Outreach), Paul Kirshen (Project Coordinator, PI, ASI), Steve Miller (Outreach), Chris Keely (Outreach)

**A. Progress overview: State the overall goal of your project, and briefly summarize in one or two paragraphs, what you planned to accomplish during this period and your progress on tasks for this reporting period. This overview will be made public for all reports, including confidential submissions.**

Great Bay National Estuary Research Reserve (GBNERR) is located in southeastern New Hampshire (NH) and includes 20,172 acres of open water, wetlands, and upland. The watershed that drains into the Reserve of 1,084 square miles is heavily forested with wetlands but also has 9 % of its area urban, which is increasing. The major climate change stressors in the region include increases in air and water temperatures, the frequency of extreme hot days, sea level rise, changes in precipitation and runoff patterns, and more intense storms. GBNERR has clearly articulated its concern about the impacts of climate change on local communities whose activities impact the watershed. The UNH team is undertaking a collaborative planning effort to develop an integrated climate change adaptation plan for a case study area with a range of land uses on a major tributary and estuary to Great Bay where climate change will exacerbate its present challenges with 1) storm water, 2) nonpoint source pollution, 3) land use, and 4) the protection and restoration of downstream marshes and fisheries. These climate change stressors also have the potential to impact public health. Because the stressors in the case study area are intertwined, they can be most efficiently and effectively managed in an integrated fashion. The case study area is the portion of the Town of Exeter, NH in the Exeter/Squamscott River Basin, which includes most of the town's area and is just upstream of Great Bay as shown in the Appendix. However, because portions of other towns reside in the watershed upstream of Exeter, we are assessing their contributions to the impacts on the river system to provide a comprehensive analysis and management strategy.

**Our project goals are to:** 1. Develop a science-based, integrated climate change adaptation strategy for this section of Exeter NH with a focus on the four intertwined problems, and 2. Implement, evaluate, and document the collaborative planning process and share the project results as a model for the region and nation.

Our major short-term goals for this period as reported in our last progress report and our progress towards them are below.

“We plan to have the models calibrated and verified by mid- September and then complete the modeling for the vulnerability assessment by end of October so the results can be presented to the community and Project Advisory Committee close to that time. Engagement will then focus upon communities of place as the CAPE team develops adaptation possibilities to analyze.”

We are using models to translate climate and sea level changes into impacts. The flow portions of these models were not calibrated and verified until early December 2013 (See Section C). The water quality portions have not yet been calibrated and verified. The model used to examine impacts of the entire watershed on flows and pollutant loads in Exeter, HSPF, is a particularly difficult model to use with poor documentation. Its benefits are its accuracy. Because the water quality portions of the CAPE models are still being calibrated and verified, we have started the impact analysis of extremely high precipitation events, that is, river flooding and stormwater runoff. We did not start this modeling until mid-January 2014. Because the stormwater modeling depends upon the water surface flood elevations in the river, we have to complete the flood analysis before we can start the stormwater analysis. The flood analysis should be complete by March 7. The water quality modeling should start late March. Thus we are not planning to have results of the impacts on the community (vulnerability assessment) until late April.

This delay in the completion of the vulnerability assessment has delayed the activities of the Engagement team (see Section B).

**B. Working with Intended Users: Describe the progress on tasks related to the integration of intended users into the project for this reporting period. What did you learn? Have there been any unanticipated challenges or opportunities? Who has been involved? Has interaction with intended users brought about any changes to your methods for integration of intended users, the intended users involved, or your project objectives? How do you anticipate working with intended users in the next six months?**

- **Describe the progress on tasks related to the integration of intended users into the project for this reporting period.**

The integration of intended users remains a key focus for the project, led by the CAPE Engagement Team in close coordination with the full project team. The elements of engagement are organized below by audience, with tasks completed during this reporting period described in chronological order.

Citizen Working Group (CWG). The CWG is a local stakeholder advisory board that meets with the engagement team and biophysical scientists on a near-monthly basis. The CWG contains representatives from the Exeter Select Board, local businesses, non-profits, faith-based organizations, the River Study Committee, and residents of various neighborhoods. There was youth participation earlier on in the project. The project team has met with the CWG three times during this reporting period as below. See Appendix for meeting agendas. The CWG meetings have been very informative for identifying and prioritizing ecosystem and public health information needs for the town climate change adaptation plan. This citizen input has helped to shape plans for ecosystem impact considerations for directing modeling outputs.

- September 26 2013– The purpose of this CWG gathering was to introduce the Stormwater Management Model and for the group to understand the inputs and limitations. CWG was asked to contribute local knowledge to inform the operation of the model, and to prioritize natural resource concerns for modeling. We also talked about next steps for the project, and invited CWG to join us at the Exeter Beer & Chili Festival (see below).
- October 24 2013 – We discussed the outreach that occurred at the Beer & Chili fest and how CAPE is trying to build social capital within the community, the project website, and additional upcoming community outreach.
- December 12, 2013 – Many from the CWG participated in the Annual Report-back to Town meeting (see below).
- January 23 2014– The CWG was given several homework assignments. They were asked to review a draft outline for the adaptation plan and return comments, to review a summary of vulnerability concerns identified by the community to date, and to write a short paragraph about their vision for Exeter in the context of climate change.
- February 20, 2014 – We intended to meet with CWG but had postponed this meeting (see challenges section)

Annual Report-back to Town. On December 12, 2013, the CAPE team hosted a half-day meeting at Exeter Town Hall to present the project’s progress during Year 1, including preliminary findings and a vision for next steps (see Figure 1). The primary audience was town officials and staff and civic leaders, with approximately 25-30 people attending from Exeter. Survey data were collected from attendees to evaluate the demographics of those in attendance, comprehension of the presentations, perceptions of CAPE’s success in Year 1, and the meeting overall.



**Figure 1. The CAPE team delivers a Year 1 in Review presentation to the town on December 12, 2013.**

Eighteen people responded to an evaluation of this meeting, including members of the Board of Selectmen, the Town Engineer, Water & Sewer, the River Study Committee, Conservation Committee, NH Coastal Risks and Hazard Commission, NH Sea Grant, Cooperative Extension, and a local pastor. From their feedback, we learned that the overall response to the presentations of the preliminary models was good; the CAPE team scored an average of '4' on a scale ranging from 1 (poor) to 5 (best). Notably, participants reported that our use of language was much improved (e.g., less technical jargon, more understandable words). The group provided feedback on how to improve specific presentations and meeting format as we plan future public meetings. When asked, "How can CAPE help you do your work/become a more informed citizen?", common themes were to provide more information about the effect of climate change on natural resources, as well as the economic and social costs of storm impacts. Respondents commented that "This information is incredibly important to the Town right now" and "There is a serious risk for housing flooding in Water St and Court St areas and other areas as well as the Academy on Tan Lane. The Exeter River and wildlife are in trouble. Storm drains, culverts, piping, and road runoff are problems that need to be addressed". Respondents also felt that "The community at large (beyond the CWG) needs to understand risks to important parts of the town that will affect them, such as flooding at the Wastewater Treatment Park and Swayze Park. We desperately need to restore tidal wetlands."

We also learned that the majority of respondents reported having a fairly good understanding of the vulnerabilities to people, natural resources, and infrastructure from the impacts of extreme weather, but they reported having only limited knowledge about the strategies and actions that can be used to help protect Exeter from these impacts. Participants very much appreciated a presentation by Chris Keeley on "What other towns are doing". This underscores a theme that we have heard consistently from the CWG as we move into the second year of CAPE: People are getting tired of talking about problems (vulnerabilities) and they want to start talking about solutions. The challenge for the team is that, from a scientific perspective, the vulnerabilities have to be well understood so that locally-relevant solutions can be discussed.

#### Integration with Exeter Community Events & Organizations

- Exeter Beer & Chili Fest (October 5) – CAPE had a tent at the festival staffed by CAPE Team and Citizen Working Group Members to introduce the project to attendees, as well as collect local knowledge. A flipchart and map of Exeter were used to capture stories and locations of local flooding. We also handed out informational cards about CAPE and the different ways that people can be involved in the project. Attendance was low this year for the fest.
- Phillips Exeter Academy (PEA) Environmental Education Coordinator, Elizabeth Stevens (October 23) - CAPE met with Betsy to discuss ways to work with the student Environmental Action Coalition and connections with PEA Facilities managers, including plans for a PEA Climate Adaptation Plan. This meeting resulted in the November and December meetings below.
- We The People (October 28) – Semra Aytur and David Burdick participated in a Climate Change Panel discussion hosted by the Exeter Congregational Church. The discussion focused on the intersection of environmental stewardship, the role of the faith community

in climate change adaptation and mitigation, human health and well-being. After the meeting, participants were asked to fill out index cards to tell us what kinds of outdoor activities they enjoy, and how they interact with their environment. Twenty-two people responded, and generated a list of activities including gardening, teaching children/grandchildren to respect nature, bicycling, dog-walking, fishing, hunting, and skiing. This allowed the CAPE team to collect more human-centered information about how people enjoy being outdoors in their local community.

- Philips Exeter Academy, students (November 5) – CAPE met with the Student Environmental Action Coalition club to discuss a partnership on the CAPE project. Emergent ideas included a photo project of climate change in Exeter or collecting stories from PEA students about how weather disruption and climate change affect life at PEA. Students are interested in activism to prompt divestment from fossil fuels in the PEA portfolio. This is beyond the scope of CAPE but we connected these students to a similar group at UNH. The advisor for the EAC is on sabbatical but we plan to reengage this group for a May community conversation to be hosted at PEA.
- Meeting with Exeter Moms (December 16)-Semra met with a group of women organized by CWG member Alyson Eberhardt to discuss ways to reach out to younger families, who were not well represented at our first public meeting. We discussed strategies such as holding future public meetings on weekday evenings with childcare provided so that parents could attend without interrupting weekend time. We also discussed projects such as Photovoice that could be integrated into middle school or high school class activities.
- Philips Exeter Academy, facilities managers (December 19) – Semra Aytur, Steve Miller, Paul Kirshen, and Sylvia Von Aulock attended this meeting with Jill Robinson (PEA Facilities planner) and Elizabeth Stevens (PEA teacher). Paul described the CAPE project, and Jill described many complementary initiatives happening at PEA in terms of land use planning and infrastructure improvements. Jill stated that she would be happy to collaborate, and expressed PEA's concerns and interests. The possibility of hosting a future public meeting at PEA was discussed.

### Communications Planning

The Engagement Team began working with the NERRS Science Collaborative staff in December 2013 to develop a communications plan in response to the challenges faced in working with many different stakeholders in Exeter. The full project team was surveyed in January 2014 to identify the decisions this project is geared toward informing and who makes those decisions. Various members of the team then worked with NSC staff to profile those audiences including where they get their information, what their interests are, and other characteristics. As a result, we have a roadmap for engaging with our primary audiences in terms of Tier 1 stakeholders (Board of Selectman, Land use boards, Municipal offices, and agencies) and Tier 2 stakeholders (those who influence Tier 1). We also began to “stratify” the evaluation data by audience group to inform both internal planning and future public meetings going forward. We will be implementing the communications plan during the next reporting period.

### **What did you learn? Have there been any unanticipated challenges or opportunities?**

This project has been rife with learning opportunities due to the complex subject matter, competing social and political issues in the town, the necessity of strategic outreach, and the breadth of expertise among interdisciplinary team members. Lessons learned, challenges, and opportunities are described below.

- Project limitations. Considerable effort has been made to remind CWG members and town partners about the limitations of CAPE. For example, much of the concerns expressed by the CWG were related to climate change mitigation (more so at the onset of the project, but it remains a topic of discussion). While mitigation is ultimately the greatest solution for adaptation, it is not within the expertise or purpose of this particular project. Developing strategies for alternatives fuels, energy efficiency, and conserving carbon sinks would be a good continuation from CAPE, and we have expressed to the town that we will note concerns about mitigation and where applicable will identify dual adaptation-mitigation strategies to help them move forward from CAPE.
- Stakeholder interface. Identifying the “right” time for stakeholder input has been difficult for several reasons. We felt it was important to develop a stakeholder advisory group (the CWG) early on so that they felt included in the process as a whole. At the same time, we knew that technical information would not be ready for refinement until later in the project. As a result, we have been caught in a holding pattern to keep stakeholders engaged beyond learning about the project’s models and processes while repeatedly offering that model results will be available soon. In addition, stakeholders have significant interest in impacts to natural resources, but we have been challenged to explain that the analysis will not be available until after we have completed future flooding, water quality, watershed, and land use modeling. We have reached a point where participants are not eager to attend meetings unless they are action-oriented, and so now will hold off on meeting with the CWG again until we have vulnerabilities to report and preliminary recommendations for adaptation strategies. This underscores the broader challenge of synchronizing the timing of the engagement process with the research process. Both the technical modeling and the detailed social science evaluation require considerable time and attention to methodological rigor to ensure that results are credible. Generally, researchers are used to “communicating” the results only after analyses have been completed. In this project, there has been an ongoing need to share “briefs”, “summaries”, “synthesis documents”, and preliminary results to inform engagement activities and keep stakeholders involved, often before all analyses have been completed. For example, we have had to make decisions about how to best optimize the timing of stakeholder input while providing them enough rigorous science to weigh in on (e.g., in defining vulnerabilities, informing technical models, reviewing model output, developing indicators and recommendations).
- Communications. We knew when we designed this project that adaptation would have to be framed into lay terms, and in relation to the values of Exeter residents. However, we did not anticipate how challenging it would be to actually do that. This has brought about the opportunity to work with NERRS Science Collaborative staff to develop a communications plan to be more strategic about how we collect, synthesize, and deliver information so that it has the greatest probability of being used by decision-makers. It is our strong recommendation that a communication plan always be integrated and required

from the beginning of a project. Any community is comprised of many different sub-groups (audiences), and being explicit about which would be the focus of our efforts (and why) from the onset may have avoided misunderstandings about the scope of our project given available resources (see below).

- Diverse community participation. Narrow representation on the CWG has been problematic in the sense that it may not provide a complete representation of the Town of Exeter's concerns and values. However, we believe this is in part balanced by close coordination with town officials through direct contact and town staff gatherings, our partnership with the town planner and our other outreach activities. An important lesson was that, in hindsight, some stakeholders were unclear as to whether CAPE's engagement efforts were meant to focus on ensuring broad public representation versus forging 'deeper' relationships with a relatively small, self-selected group of citizens and town staff who could then act as "ambassadors" for broader dialogue. The former would have required an entirely different set of methods and engagement processes, including survey sampling or political polling and social marketing techniques that are beyond the resources of this project. Since the ultimate goal is enabling Exeter to develop and implement a climate adaptation plan, we believe that our efforts can provide a valuable starting point for the "public participation" section of the plan. The Town can consider ways to continue the public dialogue as their plan moves toward implementation, beyond the life cycle of CAPE.
- Benefits of partnership with staff. Having the Town Planner in the cockpit has been critical to the success and overcoming the challenges of this project. She has provided guidance to make the project compatible with the town's internal workings (i.e., who talks to who, how people get information, what people want to know) that could have otherwise taken years for the project team to conceptualize. Her personal invitations have also been hugely successful in bringing Exeter staff and officials into meetings with project team. Her honesty and experience has also been invaluable for helping the team to reduce jargon to a level that is accessible and meaningful for each target stakeholder group.
- Determining how to communicate the connections between human health and estuarine function as potential co-benefits of adaptation planning. We are trying to move beyond a single focus on "Infrastructure" or "Natural Resources" or "People" to show how these are inter-related. Paul Stacey, Research Coordinator (GB NERRS), has been instrumental in drafting a set of short, medium, and long term indicators that begin to focus attention on these connections. Several members of the science team are working to further develop this so that it can be shared with stakeholders.

We are also continuing to learn how to balance the informational needs and participation availability of different stakeholder subgroups and to best utilize our team's diverse skills, knowledge, and perspectives to bridge research and practice.

### **Who has been involved?**

Please refer to the first question of Section B.

### **Has interaction with intended users brought about any changes to your methods for integration of intended users, the intended users involved, or your project objectives?**

As a result of corrections in communication planning thus far, we have clarified our primary audiences for the next few months of outreach efforts (described below). We have pushed back our next community conversation in order to have a more clear draft plan to share with explicit indicators and scenarios. This work will require extended working time of the full CAPE team so that it is meaningful and easily understood by stakeholders and intended users.

### **How do you anticipate working with intended users in the next six months?**

Primary outreach efforts in the next few months include one-on-one and small group meetings with audiences primarily identified in tier one. In preparation for these meetings and for our outreach in May to the broader community, we will focus on insuring that we have appropriate communication materials prepared for each. For example, Semra Aytur is working with Paul Kirshen and the technical team to make sure we have a targeted conversation with the Town Engineer. Michele Holt-Shannon and Chris Keely will focus on the scenarios and indicators work as the key focus for a community conversation.

#### Tier One Audiences:

- Town Engineer Meeting– Paul and Semra will plan for March.
- Regional Planning Commission – Michele and Sylvia will reach out in March.
- Exeter Select Board - Michele will share an update at Citizens forum in March
- Land use boards and municipal offices – Semra

#### Tier Two Audiences:

- PEA Facilities Group – Semra
- Commercial Businesses – Michele will plan a lunch conversation in April in partnership with the Chamber and Roger Stephenson.
- Exeter River Coop with Don – Semra

#### Tier Three Audiences:

- May Community Conversation – We have confirmed that we can use space on the PEA campus and will identify a date in the next few weeks for May.

#### CWG

- Over the next six months the CWG will be reviewing modeling results, draft adaptation strategies, indicator selection, and draft adaptation plan for Exeter. Their input will help refine the final adaptation plan for Exeter, helping to assure that is in the best form and function to be useful for Exeter.

### **C. Progress on project objectives for this reporting period: Describe progress on tasks related to project objectives for this reporting period. What data did you collect? Has your progress in this period brought about any changes to your methods, the integration of intended users, the intended users involved or the project objectives? Have there been any unanticipated challenges, opportunities, or lessons learned? What are your plans for meeting project objectives for the next six months?**

Because material on working with intended users has been addressed on the Section B, this section covers the technical work. This multi-member team talks approximately biweekly and has in-person meetings as needed. We are building 4 major models to accomplish the project

goals and provide material to intended users; HSPF to model the entire basin's monthly flows, water quality and low flows; HEC-HMS and HEC-RAS to model river flooding; SWMM to model storm water management in detail in Exeter and the lower portions of the basin; and a conceptual process model to analyze climate change impacts on aquatic ecosystems. In addition, scenarios of land use and climate change from 2010 to 2100 are being prepared.

- **Progress on project objectives for this reporting period**

The calibration and verification of the flow portions of the models were presented at the December 12, 2014 Town Meeting. Figure 2 through 4 show some of these results.

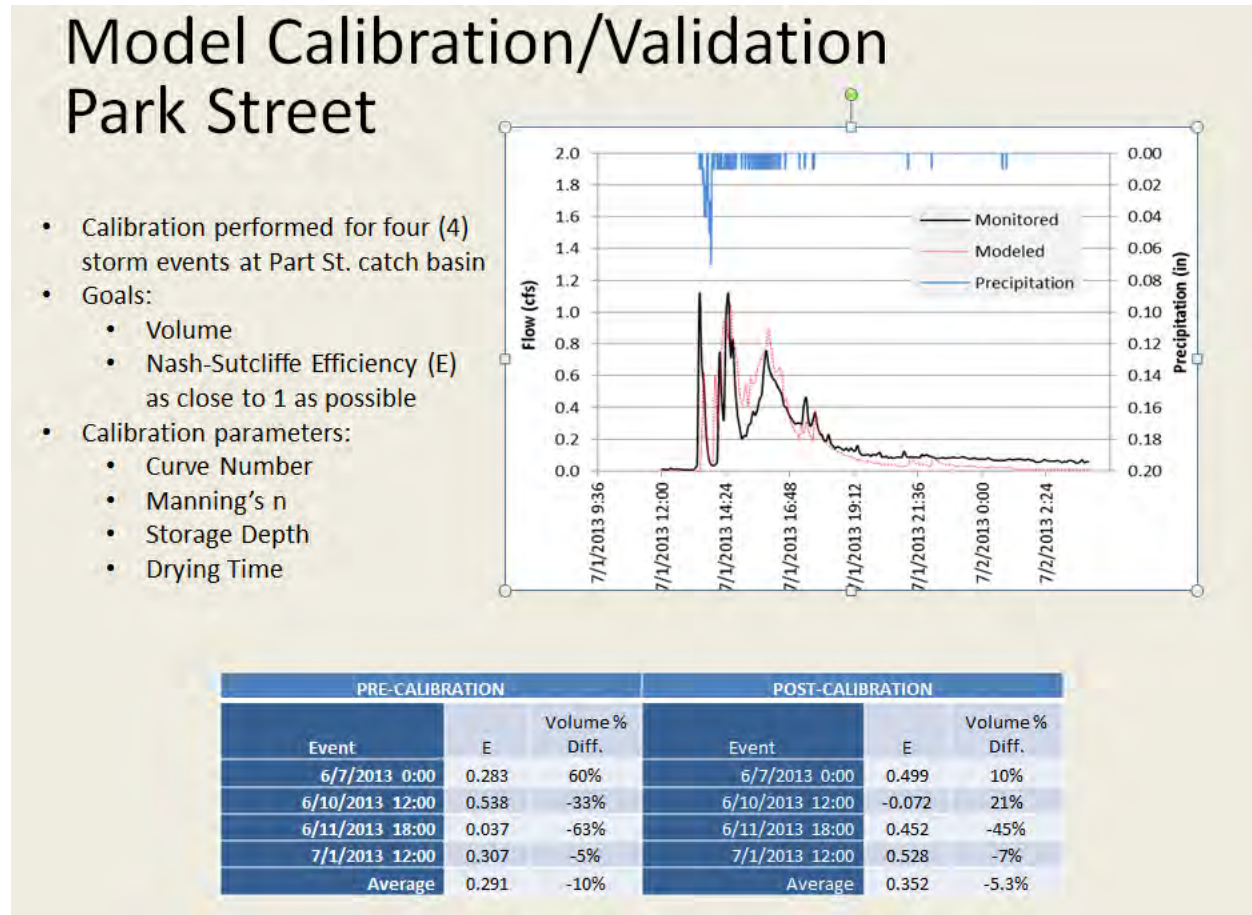
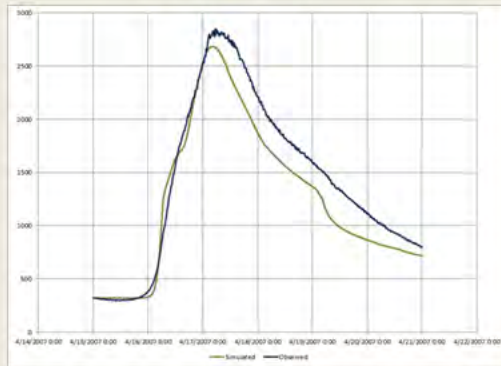


Figure 2. Calibration of SWMM

# Flood Model Calibration/Verification

2007 Patriot's Day Flood

Haigh Road Gage



Great Dam Elevations

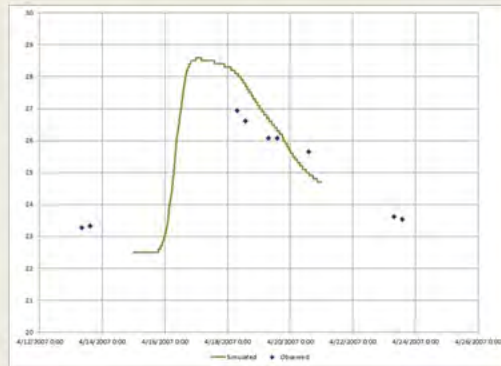
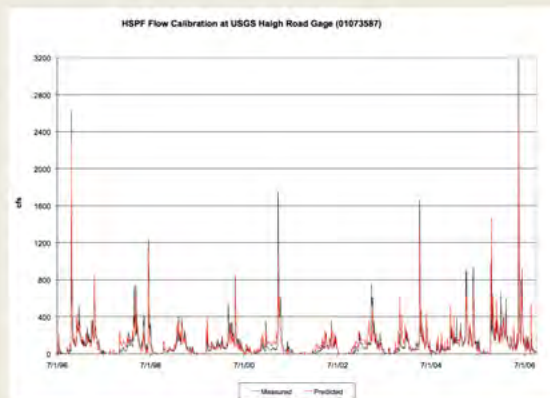


Figure 3. Calibration of HEC HMS-RAS

# Watershed Model Calibration/Verification

Haigh Road Gage  
July 1996 – July 2006



Great Dam **Estimated** Discharge  
April 2005- Sept 2006

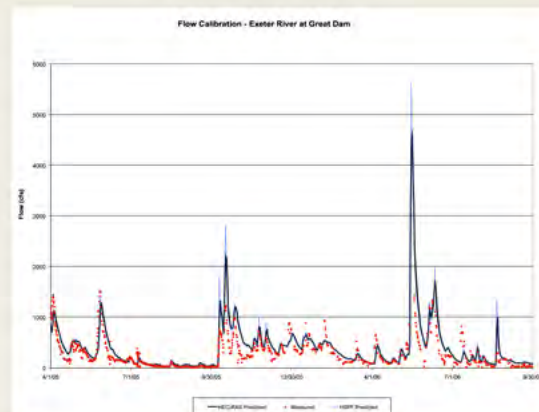


Figure 4. Calibration of HSPF.

The models were then used to illustrate the types of impacts they can describe. Examples are in Figure 5 and 6.

## Changes between Current and Climate Change scenarios: Tan Lane

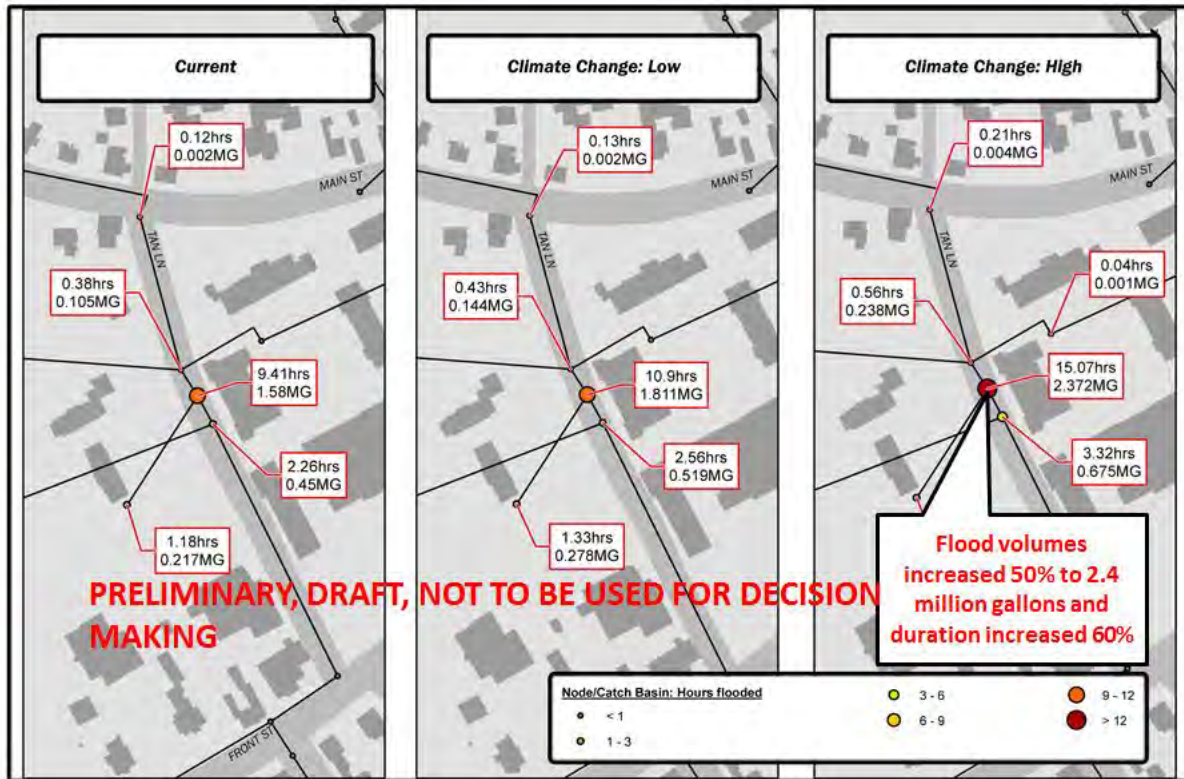


Figure 5. Changes in Drainage Flooding under Present and Future 2070 Climates

# Flood Profile - 2070 Low Flood Scenario without Great Dam

**PRELIMINARY, DRAFT, NOT TO BE USED FOR DECISION MAKING**

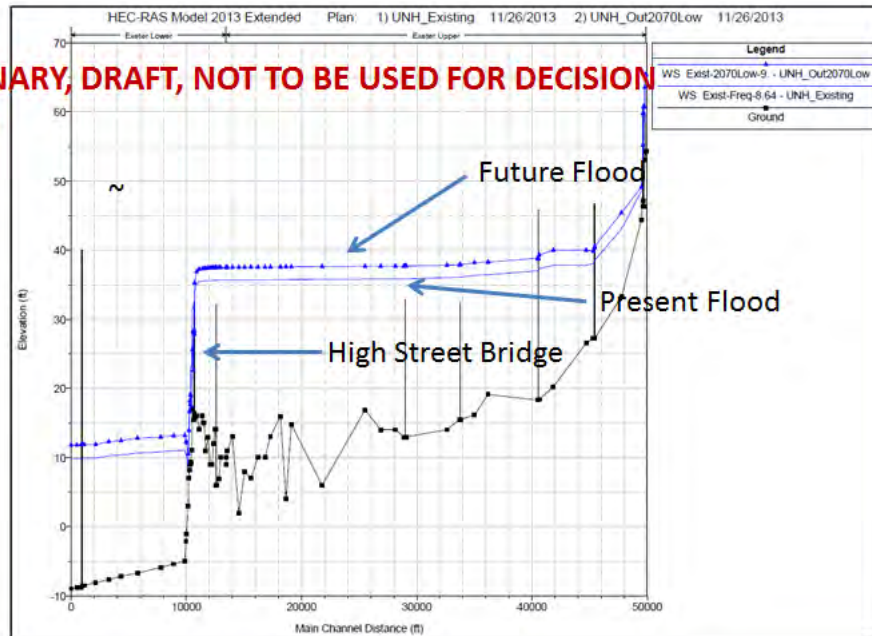


Figure 6. Changes in River Flooding under Present and Future 2070 Climates

The parameterization of the ecosystem process model cannot be carried out until the models above are functioning.

We have also developed land use change scenarios. Figure 7 shows expansion of commercial, residential, and industrial land use from the present to 2070 under a Business-as-usual scenario.

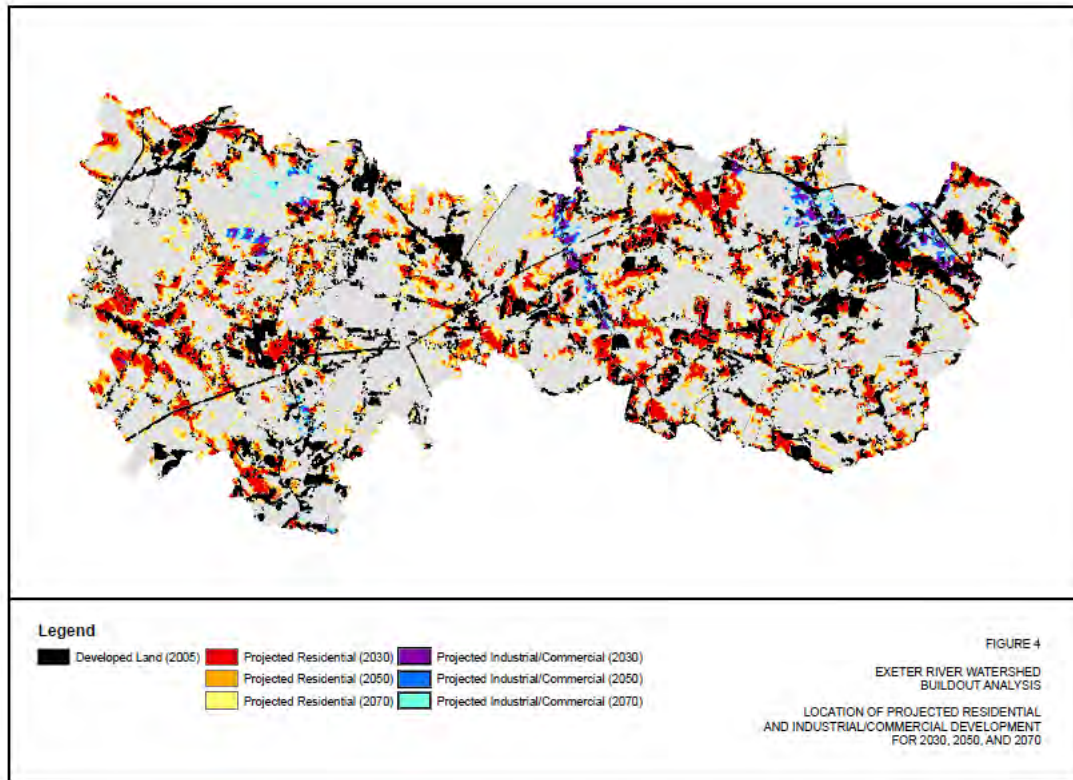


Figure 7. Land Use Change Scenario

In the context of our engagement process and with the aid of our water resources and coastal models, scenario analysis is being used to develop an adaptation strategy that will include a mix of adaptation approaches that can be implemented progressively over time and in different locations by public and private entities. Scenarios are being used to define the plausible ranges of uncertain climate and land use changes that may occur over the next 55 years. One range is the set of combined changes in precipitation, temperature, sea level rise and land use that will have the least impacts on the Town and the other set is the changes that would have the greatest negative impacts. We then will develop a strategy that reflects Exeter's values, priorities, and perspectives, functions acceptably well under both conditions, and is implemented as the climate and land use changes.

The set of scenarios being used for the river and drainage flooding in 2010 and 2040 is in Figure 8. Note that since climate and land use changes in 2040 do not exhibit major differences, one condition is being used to describe 2040 conditions.

Time Period	Land Use	Dam In /out	Design Storm 10 Y, 24h Change (fraction increase) 2010 value = 4.72 in	Design Storm 25 Y, 24 H Change (fraction increase) 2010 value = 6.00 in	Design Storm 100 Y, 24 H Change (fraction increase) 2010 value = 8.62 in	100 Year storm Surge with Increase in SLR on top of MHHW (present MHHW is 4.4 ft NAVD) present height of 100 year surge is 6.8 ft, thus this value is 11.2 ft NAVD see * below Below is the increase followed by the actual value to use ( Ft NAVD)	Increase in SLR at MHHW (4.4 ft NAVD) Below is the increase followed by the actual value to use ( Ft NAVD)	Comment
2010	Present	in	1.0			0.0 (11.2)		
2010	Present	in		1.0		0.0 (11.2)		
2010	Present	in			1.0	0.0 (11.2)		
2010	Present	in	1.0				0.	To test sensitivity to coastal boundary
2010	Present	in		1.0			0.	
2010	Present	in			1.0		0.	
2040	BAU-2040	in	1.12			Moderate increase of 0.9 ft (12.1)		Average P of Moderate and High Changes from Kirshen et al (2014)
2040	BAU-2040	in		1.12		Moderate increase of 0.9 ft (12.1)		
2040	BAU-2040	in			(1.14 +1.27)/2 =1.21	Moderate increase of 0.9 ft (12.1)		
2040	BAU-2040	in	1.12				Moderate increase of 0.9 ft (5.3)	The MHHW runs may not be necessary
2040	BAU-2040	in		1.12			Moderate increase of 0.9 ft (5.3)	
2040	BAU-2040	in			(1.14 +1.27)/2 =1.21		Moderate increase of 0.9 ft (5.3)	

Figure 8. Present and 2040 Scenarios

- **What Data did you collect?**

We have augmented our compiled existing data with new data from NH Fish & Game. They deployed datasondes just below the Great Dam just upstream of the transition from the freshwater Exeter River to the tidal Squamscott River. The data (water temperature, salinity, pH, dissolved oxygen, turbidity) were collected for 4 recent years (2008-11) during the Spring, which is a critical time for anadromous fish migrating over the dam to freshwater habitat.

Additional data have been collected since August 2013 using water salinity/specific conductivity and water depth using data sensors provided from the NH EPSCoR project. Two sensors were provided and deployed just above the dam in the Exeter River and in the Squamscott River at the PEA crew dock.

Additional data have also been collected, compiled and provided to the modeling team, including the 2013 NHDES/VRAP data at an array of sites in the Exeter River.

All of these data will be extremely useful for calibrating model output to reflect actual historical conditions that is critical for developing accurate future scenarios.

Working with the Engagement team, we have collected social science datasets to help the team better understand the place-based values of Exeter. This information is being used to design the formats for the display of the results of the models.

- **Has your progress in this period brought about any changes to your methods, the integration of intended users, the intended users involved or the project objectives?**

There have been no changes in the methods but the engagement schedule for the Spring and Summer have been revised. This will not impact the final product.

- **Have there been any unanticipated challenges, opportunities, or lessons learned?**

Many of these have been discussed in Section B. The primary technical challenge is the complexity of the HSPF model. We also anticipate some challenges in using climate change scenarios. These, however, are all challenges some members of the modeling team have faced in the past and they will be satisfactorily met. The lesson remains the age-old one that computer modeling always takes longer than anticipated and all situations are unique. But the latter is one of the reasons we use models.

- **What are your plans for meeting project objectives for the next six months?**

We plan to complete the modeling for the vulnerability assessment by end of April, and then present results to stakeholders in May through various means described in Section B. The adaptation plan will then be developed over the summer with stakeholders and presented to the Town in late summer. We have developed an initial outline for the final report to the Town.

**D. Benefit to NERRS and NOAA: List any project-related products, accomplishments, or discoveries that may be of interest to scientists or managers working on similar issues, your peers in the NERRS, or to NOAA. These may include, but are not limited to, workshops, trainings, or webinars; expert speakers; new publications; and new partnerships or key findings related to collaboration or applied science.**

The set of activities also includes those from previous progress reports.

March 2013

- Paul Kirshen and Sylvia von Aulock were interviewed by seacoast-area media: <http://www.seacoastonline.com/articles/20130210-NEWS-302100336>
- Abstract submitted to the American Public Health Association Annual conference (October, 2013): Aytur, Kirshen, Becker, Von Aulock, et al. *Community engagement for climate-ready communities: The role of Community Based Participatory Research (CBPR) in local climate adaptation planning and evaluation.*
- <http://www.accesstv98.com/> to search schedule for Exeter High School “Hawk Talk” program.

September 2013

- The previously described enhanced vulnerability maps of People, Infrastructure, and Natural Resources, the upcoming workshop with Delaware NERR in May 2014, and the Clean Air-Cool Planet final report on businesses and climate change concerns in the region.
- Abstract accepted by American Public Health Association Annual meeting, Boston, MA, November, 2013, Community engagement for climate-ready communities: The role of community based participatory research (CBPR) in local climate adaptation planning and evaluation.
- Abstract accepted by American Society of Civil Engineers Environmental and Water Resources Institute Annual Meeting, June 2014, Development of an Integrated Water Resources and Coastal Adaptation Plan for Exeter NH.

March 2014 (this period)

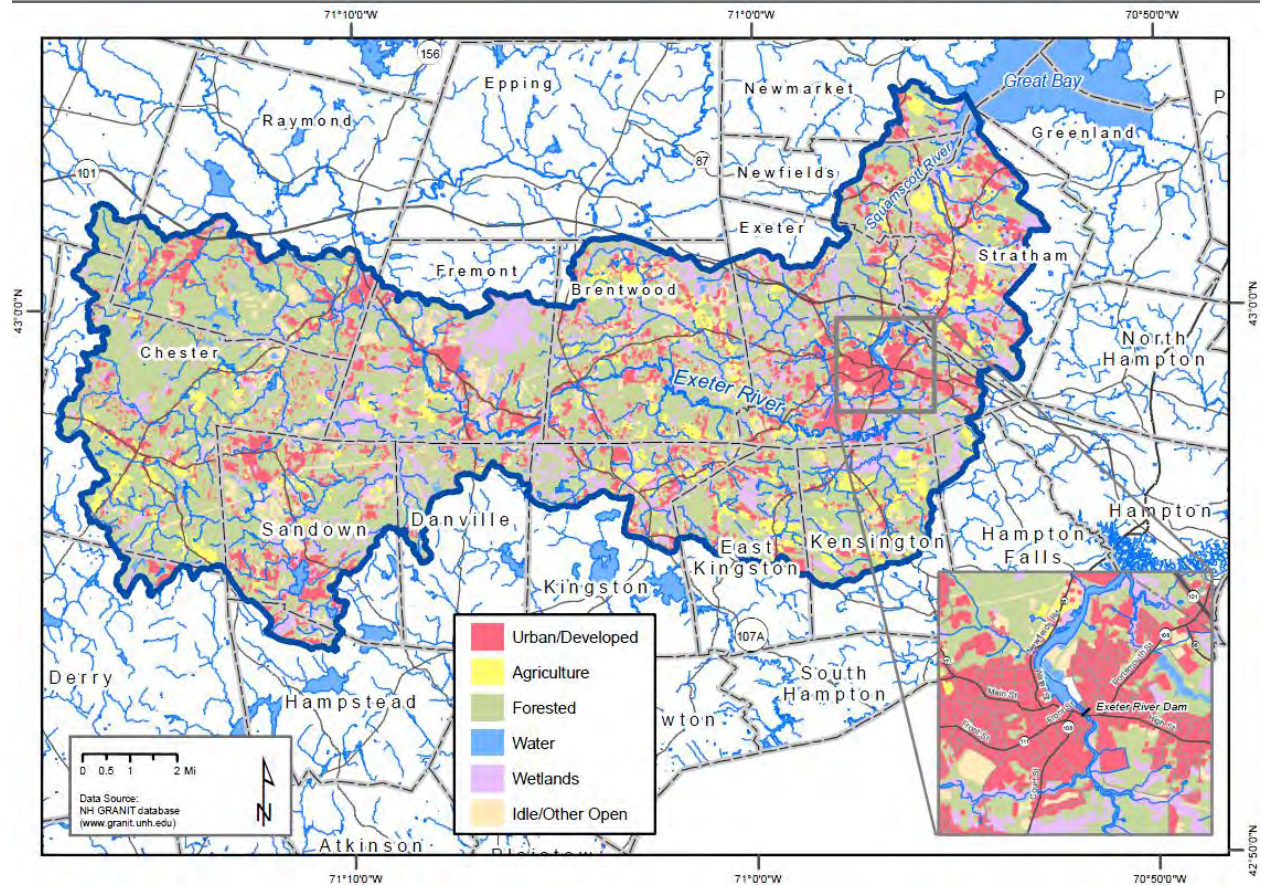
- Abstract Accepted for UCOWR/CUAHSI/NIWR Conference, Tufts University, June 18-21, 2014, Integrated Water Resources Adaptation Planning in Exeter NH.
- Abstract Accepted for UCOWR/CUAHSI/NIWR Conference, Tufts University, June 18-21, 2014, Transdisciplinary Approach to Creating Climate-Resilient Communities: Lessons Learned from Exeter, NH.
- Abstract Submitted to Restore America's Estuaries National Summit, November 2014, Using Scenario Planning for Integrated Coastal Adaptation Planning in Exeter NH.
- Abstract Submitted to Restore America's Estuaries National Summit, November 2014, A Transdisciplinary Approach to Creating Climate-Resilient Communities: Lessons Learned from Exeter, NH.

**E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.**

None.

## Appendix

### Exeter-Squamscott River Watershed Generalized Land Use - 2005



Project Site

**Citizen Working Group (CWG) Agenda**  
**September 26, 2013 – 5:00 to 7:30 PM**  
**Exeter Senior Center, Court Street, Exeter**

**Meeting Goals:**

1. Update the CWG on CAPE progress and future plans
2. CWG to understand the basics of the SWMM model (input variables, limitations)
3. CWG understands decisions supported by the Stormwater Management Model (SWMM)

**5:00** Food (sandwiches, drinks) and networking with CWG members

**5:30** Project Updates (Share the “5 big Exeter decisions” we see this project as supporting, research timeline update – draft vulnerability assessment in Nov?), *Paul K.*

**5:45** Presentation and discussion of Stormwater Management Model (SWMM) *Renee*

**6:45** Next steps for community engagement *Michele et al*

- We the People event
- Beer & Chili Fest
- November presentation Q&A with Town Officials, etc.
- Neighborhood conversations

**7:20** Wrap up

**7:30** Adjourn

**Citizen Working Group (CWG) Agenda**  
**Oct. 24, 2013 5 to 7:30 PM**  
**Exeter Senior Center, Court Street Exeter**

Meeting Goals:

1. Update the CWG on CAPE progress and check in with CWG Members
2. Review concerns as expressed by CWG last meeting (Sept 26)
3. Solicit new issues/concerns (oral and with cards)
4. Come up with 2 action items for Steve and Dave to follow up on based on priority concerns [e.g., human health model for river use (pollutants), present DO data at upcoming CGW meeting; organize walk for SLR and marsh barriers and sites for potential migration]

5:00 PM Food (sandwiches, drinks) and networking with CWG members

5:30 Welcome, introductions, issues - Steve

5:45 12-12-13 CAPE event with Town Officials - ?

6:00 Discussion/review of the next “Big Decisions” in Exeter – Paul

6:15 Web site review/input - Chris

6:45 Discussion/input session Part 2 Natural Resources - Dave and Steve J.

7:30 Adjourn

**Exeter’s Next Big Decisions Related to Flooding and Water Quality:**

- Should Exeter remove or repair the Great Dam?
- How do we best upgrade the Wastewater Treatment Plant to reduce its potential for flooding and ensure water quality?
- What is the best way to rebuild and replace String Bridge?
- Should the DPW increase the capacity of Linden and Court Streets Culverts on Little River?
- What should be considered when Exeter updates Stormwater Management Regulations?
- How should we reduce the risk of flooding of Sewage Pump Stations (Court St, Main Station, Webster Station)?
- How do we protect the drinking water treatment plant from flooding?

Concerns from 9/26 CWG regarding natural resources

1. Seafood safety -mercury and other pollutants: What you can / should not eat from the river.
2. Herring population decline in the river.

3. Will you use Dissolved Oxygen data to assess river health? Are VRAB Data source being used?
4. Concerns about water quality in the river now and into the future.
5. Many people are Bird Watchers and there is a connection to bird life in the Bay.
6. People identify with the seacoast vs. NH, “I live on the sea coast” not “I live in NH”.
7. Wetlands and marsh migration areas were a concern. The idea of a walking tour in Exeter was offered to look at places in Exeter that might be future areas for migration. A discussion about seawalls

### **Jan 23, 2014 Climate Adaptation Plan for Exeter Citizen Working Group Meeting**

#### **Agenda**

- 5PM Food, Networking, complete survey
- 5:30 Welcome and introductions
- 5:35 Presentation – “What Adaptation Looks Like”
- 5:50 Discussion – what it might look like in Exeter.
- 6:10 Review draft outline of Adaptation Plan for Exeter
- 6:25 Discussion
- 6:45 Adaptation Plan for Exeter Vision Statement – begin to help craft this
- 7:05 Discussion – Public Outreach on Climate Change and Adaptation in Exeter
- 7:15 Confirm CWG Members that can attend and help with community dialogs.
- 7:30 Adjourn